Description

Dendrite Elongation Inhibitor for Melanocyte and Skin Preparation for External Use containing the same

Technical Field

The present invention relates to a dendrite elongation inhibitor for melanocytes and a skin preparation for external use containing the dendrite elongation inhibitor for melanocytes as an active ingredient.

Background Art

~~Keeping~~ Many women hope to keep skin~~s~~ fair and beautiful ~~is what many women hope~~, and many whitening cosmetics have therefore been developed. ~~For example,~~ Examples include whitening cosmetics ~~can be exemplified by cosmetics containing~~which contain ascorbic acid or a derivative thereof, kojic acid or a derivative thereof, tranexamic acid or a derivative thereof, hydroquinone glycoside, or the like. However, most of these cosmetics have a mechanism of action ~~utilizing the action of inhibiting~~in which tyrosinase and ~~inhibiting the~~ thereby biosynthesis of melanin are inhibited~~, and we had to say that there is a~~ with limited effectiveness ~~limit on its effect~~. That is, even though the whitening cosmetics containing ~~those~~ these active ingredients ~~as active ingredients~~ are effective for symptoms such as age spots, freckles, and dark complexion that

result from the abnormally accelerated production of melanin, ~~we had to say that~~ such whitening cosmetics do not have much effect on dyschromatosis ~~to~~ for which the amount of melanin produced is a lesser ~~contributes~~contributing factor. In other words, ~~there exists~~for dyschromatosis, ~~for which~~ tyrosinase inhibitors are ~~not or~~ less effective or not effective at all, and ~~it has been desired that~~ development of means for alleviating such dyschromatosis is ~~developed~~desirable.

~~On the other hand, e~~Examples of dyschromatosis ~~to which the amount of melanin produced~~in which melanin production is a lesser ~~contributes~~ contributing factor include dyschromatosis~~those~~ resulting from the accelerated migration of melanin granules from melanocytic dendrites. Although it is considered ~~for~~ that such dyschromatosis ~~to~~ is treatable by inhibiting the elongation of dendrites that occurs when melanocytes allows melanin granules to migrate, ~~not so many~~few whitening agents utilizing such a mechanism have been known. ~~That is, it can be said that t~~There has been a demand for the development of whitening agents utilizing such a mechanism.

The inventors of the present invention have found that Achillea millefolium L. ~~that~~ is a source plant ~~from which~~for ~~the inventors of the present invention have found~~ Centaureidin (5,7-dihydroxy-3,6-dimethoxy-2-(5-hydroxy-4-methoxyphenyl)-4H-1-benzopyran-4-on; hereinafter also referred to as "Compound 1")

~~that~~ which is a compound represented by ~~the general formula~~general formula (1). It ~~has already been~~was known ~~to have~~that its extract is useful as a humectant for cosmetics (JP-A 02-172907), ~~to be useful~~ and in the stabilization of kojic acid in cosmetics (JP-A 07-17848), ~~to have action of inhibiting~~. The extract inhibits tyrosinase (JP-A 08-104646), ~~to have action of eradicating~~eradicates active oxygen (JP-A 11-246336), ~~to have action of inhibiting~~inhibits α-MSH (JP-A 11-349435), and so on. However, it ~~has~~ was not ~~been~~ known at all that Centaureidin inhibits the elongation of melanocytic dendrites and that it is useful for alleviating, by such action, dyschromatosis, a condition for ~~on~~ which melanin production inhibitors ~~utilizing usual~~with a tyrosinase inhibitory action are not completely effective~~or less effective~~.

Moreover, ~~the~~ a compound represented by ~~the general formula~~general formula (1), such as Centaureidin, ~~has~~ was ~~already been~~ known:

1) to be ~~incorporated~~ found in plants of the genus Artemisia and useful for treating allergic diseases (published international application WO 20020419109);

2) to ~~has~~ have anti-cancer action (US patent No. 493540); and

3) to be ~~incorporated~~ found in plants of the genus Centaurea cyanus (Flamini Guido et. al., Phytochemistry, 58(8), 1229-1233, 2001).

However, it ~~has~~ was not ~~been~~ known at all that such a substance is ~~incorporated~~ present in Achillea millefolium L. of the family

Asteraceaeis. It ~~has~~ was not ~~been~~ known in the least that ~~the~~ this substance inhibits the elongation of melanocytic dendrites, and that it is useful for alleviating, by such action, dyschromatosis ~~on~~ for which melanin production inhibitors ~~utilizing usual~~with tyrosinase inhibitory action are not ~~or less~~completely effective.

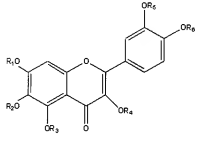
Disclosure of the Invention

The present invention has been achieved under such circumstances, and an object of the present invention is to provide a useful ingredient for inhibiting the elongation of melanocytic dendrites and alleviating, by this action, dyschromatosis ~~on which~~refractory to treatment with melanin production inhibitors ~~utilizing usual~~with tyrosinase inhibitory action ~~are not or less effective~~.

In light of such circumstances, the inventors ~~of the present invention~~ have conducted extensive studies and redoubled efforts to acquire a useful ingredient for inhibiting the elongation of melanocytic dendrites and alleviating, by this action, dyschromatosis ~~on which~~refractory to treatment with melanin production inhibitors ~~utilizing usual~~with tyrosinase inhibitory action ~~are not or less effective~~. As a result, the inventors ~~of the present invention~~ have completed the present invention by finding ~~out~~ that a compound represented by ~~the general formula~~general formula (1) and/or a salt thereof, which ~~is incorporated in~~can be isolated

from Achillea millefolium L. of the family Asteraceaeis ~~have (has)~~ such action. Namely, the present invention relates to a technique shown below.

(1) A dendrite elongation inhibitor for melanocytes consisting of a compound represented by the following general formula (1):

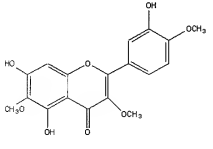


formula (1)

and/or a salt thereof,

wherein R_1, R_2, R_3, R_4, R_5, and R_6 each independently represent a hydrogen atom or a C_{1-4} alkyl group.

(2) The dendrite elongation inhibitor for melanocytes according to (1), characterized in that the compound represented by ~~the general formula~~general formula (1) is Centaureidin indicated by the following formula.



(3) A skin preparation for external use for inhibiting elongation of melanocytic dendrites, comprising the dendrite

elongation inhibitor for melanocytes according to (1) or (2) as an active ingredient.

(4) The skin preparation for external use for inhibiting elongation of melanocytic dendrites according to (3), characterized in that the skin preparation for external use is used for alleviating dyschromatosis on which tyrosinase inhibitors have insufficient effect.

(5) The skin preparation for external use for inhibiting elongation of melanocytic dendrites according to (3) or (4), characterized in that the skin preparation for external use is a cosmetic.

Best Mode for carrying out the Invention

(1) Dendrite elongation inhibitor for melanocyte of the present invention

A dendrite elongation inhibitor for melanocytes of the present invention consists of a compound represented by the above-described general formula (1) and/or a salt thereof.

In ~~the general formula~~general formula (1), R_1, R_2, R_3, R_4, R_5, and R_6 each independently represent a hydrogen atom or an alkyl group.

The alkyl group is preferably a C_{1-4} alkyl group, and examples thereof include a methyl group, an ethyl group, a propyl group, a 1-methylethyl group, a n-butyl group, a 1-methylpropyl group, a 2-methylpropyl group, and a 1,1-dimethylethyl group. Of those,

particularly preferred is a methyl group.

The compound represented by ~~the general formula~~general formula (1) can preferably be exemplified by Centaureidin.

Such a compound represented by ~~the general formula~~general formula (1) can be directly used, or can be used in a salt form after treatment with alkali.

The salt can be applied without particular limitation as long as it is physiologically acceptable, and can preferably be exemplified by alkali metal salts such as sodium salts and potassium salts, alkaline-earth metal salts such as calcium salts and magnesium salts, ammonium salts, organic amine salts such as triethanolamine salts, and triethylamine salts, and basic amino acid salts such as lysine salts and arginine salts. Particularly preferred are alkali metal salts, which are ~~easy to be~~easily prepared.

In a skin preparation for external use of the present invention, the compound represented by ~~the general formula~~general formula (1) and/or the salt thereof can be incorporated alone or as a combination of two or more ~~kinds of them can be incorporated~~.

Such a compound represented by ~~the general formula~~general formula (1) and/or a salt thereof may be purified ~~one~~, and may be an extract from a plant or a fraction thereof, or the like containing an effective amount of the compound represented by ~~the general formula~~general formula (1) and/or the salt thereof.

Plants of the genus Achillea sp. of the family Asteraceaeis,

preferably Achillea millefolium L. of the family Asteraceaeis can be used to obtain the extract or a fraction thereofas ~~such plants~~. ~~A plant~~Material used in the extraction of the compound represented by ~~the general formula~~general formula (1) and/or the salt thereof may be the entire plant, a part of the plant containing the compound represented by ~~the general formula~~general formula (1) and/or the salt thereof, or a processed product of the plant. For example, an extract of the above-ground part of the genus Achillea millefolium L. of the family Asteraceaeis can be purified and fractionated to obtain the compound represented by ~~the general formula~~general formula (1) and/or the salt thereof. The compound represented by ~~the general formula~~general formula (1) and/or the salt thereof can be identified by X-ray analysis or the like.

The extract ~~can~~is ~~particularly~~ preferably ~~be exemplified by an extract with~~ obtained using a highly polar solvent. The highly polar solvent ~~can~~ is preferably ~~be exemplified by~~: ethers such as diethyl ether, isopropyl ether, and tetrahydrofuran; halogenated hydrocarbons such as methylene chloride and chloroform; esters such as ethyl acetate and methyl formate; ketones such as acetone and methylethylketone; nitriles such as acetonitrile; alcohols such as 1,3-butanediol, ethanol, and isopropyl alcohol; and water. Of those, alcohols are particularly preferred. It is noted that the above-described solvent may be one kind or a mixture of two or more ~~kinds of them~~.

Extraction may typically be carried out by adding 1 to 10 times by weight of ~~a~~ the solvent with respect to the entire plant or a part of the plant, followed by ~~a few day~~ immersion for a few days if carried out at room temperature or a few ~~hour immersion~~ hours if carried out around ~~a~~ the boiling point of the solvent. After extraction, the solvent can be removed by vacuum concentration or the like, if necessary. The compound represented by ~~the general formula~~general formula (1) can be isolated from the extract from which solvent has been removed, by liquid-liquid extraction with ethyl acetate and water, and the like, or purification by silica gel column chromatography using, for example, chloroform-methanol as an eluting solvent, or the like.

A preferable ~~content~~ concentration of the compound represented by ~~the general formula~~general formula (1) and/or the salt thereof in a skin preparation for external use of the present invention is 0.001 to 10% by weight, more preferably 0.005 to 5% by weight with respect to the total amount of the skin preparation for external use. This is because, if the ~~content~~ concentration is too ~~small~~low, inhibitory action on the elongation of melanocytic dendrites may not be exhibited; while, if the content is too ~~large~~high, the action may level off and may unnecessarily inhibit the degree of freedom of a prescription.

(Example of production)

Ten kilograms of ~~a~~ dried product of the above-ground part of

the genus Achillea millefolium L. of the family Asteraceaeis) was cut into narrow pieces, which were then added to ethanol 501—50 liter and heated to reflux for 3 hours. After cooled cooling to room temperature, the resulting mixture was concentrated under vacuum concentration, and 11—1 liter of ethyl acetate and water were added thereto. The resulting mixture was subjected to liquid-liquid extraction to take out the phase ofremove ethyl acetate, followed by vacuum concentration to prepare an extract. After dissolved dissolving the concentrate in chloroform, the residue was charged on silica gel column chromatography and purified with an eluting solvent chloroform:methanol=100:1 to 70:30 to give 211.5 mg of Compound 1. The structure was determined by X-ray analysis.

(2) Skin preparation for external use of the present invention

A skin preparation for external use of the present invention is characterized by containing the above-described dendrite elongation inhibitor for melanocytes of the present invention. As used herein, aA skin preparation for external use used herein meansis a general term for compositions applied for external use forexternally to skins, and can be exemplified by cosmetics including quasi-drugs, dermatologic drugs for external use, and dermatologic sundry articles for external use. Of those, particularly preferred are cosmetics. This is because the above-described melanocyte dendrite elongation inhibitor for melanocytes of the present

invention has excellent safety, so that the melanocyte dendrite elongation inhibitor ~~for melanocytes~~ can be used continually and habitually as a cosmetic~~s~~, and more satisfactorily exhibit whitening action ~~in~~ with such a usage pattern.

The dosage forms of cosmetics are not particularly limited and the cosmetics can be used not only in emulsified dosage forms such as cream and milky lotions but in solution dosage forms such as skin lotions and essences, because the dendrite elongation inhibitor of the present invention has particularly high physical properties of polarity.

Skin preparation for external use of the present invention can contain ~~the~~ optional ingredients used generally in ~~a~~ skin preparations for external use, besides the dendrite elongation inhibitor for melanocytes described above. Preferable examples of ~~the~~ optional ingredients include: hydrocarbons such as squalene, liquid paraffin, light-gravity liquid isoparaffin, heavy-gravity liquid isoparaffin, microcrystalline wax, and solid paraffin; silicones such as dimethycon, femethycon, cyclomethycon, amodimethycon, polyether denatured silicone; esters such as jojoba oil, carnauba wax, haze wax, bees wax, spermaceti wax, octyldodecyl oleate, isopropyl myristate, neopentyl glycol diisostearate, and malic diisostearate; aliphatic acids such as stearic acid, lauric acid, myristic acid, palmitic acid, isostearic acid, isopalmitic acid, behenic acid, and oleic acid; higher alcohols such as behenyl

alcohol(1-docosanol), cetanol, oleyl alcohol, and octadecyl alcohol; triglycerides such as castor oil, coconut oil, hydrofined coconut oil, camellia oil, wheat germ oil, isostearate triglyceride, isooctanoate triglyceride, and olive oil; polyhydric alcohols such as 1,3-butanediol, glycerin, diglycerin, dipropylene glycol, polyethylene glycol, 1,2-pentandiol, 1,2-hexylene glycol, and isoprene glycol; nonionic detergents such as sorbitan sesquiolate, sorbitan monooleate, sorbitan trioleate, sorbitan sesquistearate, sorbitan monostearate, polyoxyethylene sorbitan monooleate, polyoxyethylene sorbitan monostearate, polyoxyethylene stearate, polyoxyethyleneoleate, polyoxyethylene glyceril fatty ester, polyexyethylene alkyl ether, and polyoxyethylene hardened castor oil; anionic detergents such as sodium lauryl stearate, polyoxyethylene alkyl sulfate, and sulfosuccinate; cationic detergents such as quaternary alkyl ammonium salt; ampholytic detergents such as alkyl betaine; organic powders such as crystalline cellulose, crosslinking type methylpolysiloxane, polyethylene powder, and acrylic resin powder; powders that can be surface-treated such as talc, mica, sericite, magnesium carbonate, calcium carbonate, titanium dioxide, iron oxide, iron blue, ultramarine, titanic mica, titanic sericite, and silica; thickening agents such as alkyl acrylate-alkyl methacrylate copolymer and/or a salt thereof, carboxyvinyl polymer and/or a salt thereof, xanthan gum, and hydroxypropyl cellulose; active ingredients such as vitamins,

terpenes, and steroids; examples of vitamins include retinol, retinoic acid, tocopherol, riboflavin, pyridoxin, ascorbic acid, and ascorbic phosphate; examples of terpenes include glycyrrhizic acid salt, glycyrrhetin, ursolic acid, and oleanolic acid; examples of steroids include estradiol, ethynilestradiol, and estriol; antiseptic agents such as phenoxyethanol, parabens, Hibitane Gluconate, and benzalkonium chloride; and UV absorbing agents such as dimethylamino benzoate, cinnamates, and benzophenones.

Of course, a whitening agent having a different mechanism from that of the dendrite elongation inhibitor of the present invention, for example, ascorbic acid or a derivative thereof, kojic acid or a derivative thereof, tranexamic acid or a derivative thereof, hydroquinone glycoside, or the like, can also be incorporated in the skin preparation for external use. Incorporating such a whitening agent gives at least a synergistic effect and is therefore preferred. A preferable content of such a whitening agent having a different mechanism from that of the dendrite elongation inhibitor of the present invention is 0.01 to 5% by weight in total with respect to the total amount of the skin preparation for external use.

~~Applicable disease of t~~The skin preparation for external use of the present invention ~~can also preferably be exemplified by~~is preferably applicable for treatment of dyschromatosis on which tyrosinase inhibitors have insufficient effects. "Dyschromatosis on which tyrosinase inhibitors have insufficient effects" used

herein means dyschromatosis judged by 70% or more panelists to be "dyschromatosis having no alleviation" when tested by a method described in Example 2 or the like using a tyrosinase inhibitor (e.g., arbutin).

The skin preparation for external use of the present invention can be produced by ~~treating~~ combining the above-described essential ingredient and an optional ingredient according to a standard method.

Examples

Although the present invention will more fully be described hereinafter with reference to Examples, it is understood that the present invention is not intended to be limited only to such Examples.

<Example 1>

According to a method shown below, inhibitory action on the elongation of dendrites was examined using human melanocytes.

(Reagent, etc.) Cells, basal media, and amplification additives were purchased from KURABO INDUSTRIES LTD.

(Cell) Normal human melanocyte

(Medium) Basal medium (Medium 154S) supplemented with reagents described below

(Reagent) Amplification additive: bovine pituitary extract (BPE) (final concentration of 0.4% v/v in the medium), fetal bovine serum (FBS) (final concentration of 0.5% v/v in the medium), human recombinant basic fibroblast growth factor (rFGF-B)(final

concentration of 3 ng/ml in the medium), hydrocortisone (final concentration of 0.18 μg/ml in the medium), insulin (final concentration 5 μg/ml in the medium), transferrin (final concentration of 5 μg/ml in the medium), phorbol 12-myristate 13-acetate (PMA) (final concentration of 10 ng/ml in the medium), heparin (final concentration of 3 μg/ml in the medium), and PSA solution (mixture solution of penicillin concentration of 50,000 Unit/ml, streptomycin concentration of 50 μg/ml, and amphotericin B concentration of 12.5 μg/ml; 1-ml addition with respect to 500 ml of the medium)

(Method)

The extract of Achillea millefolium L. and Compound 1 (Centaureidin) obtained in the above-described example of production were diluted in a basal medium so that the concentration of Centaureidin was brought up to 100 μg/ml, to make a sample solution. It is noted that a control is a solution having only ~~a~~ basal medium.

Normal human melanocytes were inoculated into a 48-well microplate (3,000 cells/well, 200 μl medium) and cultured at 37°C.

After 24 hours, 50 μl of the sample solution was added thereto.

~~After 24 hours of the addition of the sample solution,~~ ±Inhibition against the elongation of dendrites was observed 24 hours after addition of the sample solution.

(Result)

The result is shown in Table 1 by the length of the dendrite.

It is seen that the dendrite is elongated in the control by the effect of adding the growth factor, while elongation is inhibited in the ~~added group of~~ Centaureidin group.

Table 1

Added compound	Length of dendrite (μm)
Centaureidin	26± 8
Extract of Achillea millefolium L.	108±21
Control	140±29

<Example 2>

According to a prescription shown below, a cosmetic that was a skin preparation for external use of the present invention was prepared. That is, ingredients of I, II, and III each were heated to 70°C. II was neutralized with III and emulsified by gradually adding I with stirring. The resulting mixture was homogenized with a homogenizer, followed by cooling with stirring to give a milky lotion. Comparative Example 1 in which Compound 1 in this prescription was substituted by squalene was ~~made~~prepared. Twenty persons in total (10 persons for ~~1~~ each group) suffering from dark complexion that was not alleviated by usual cosmetics for inhibiting the production of melanin were used to examine the degree of alleviation of dark complexion ~~in a usage test~~ with use at twice per day, in the morning and evening for 30 consecutive days. The degree of alleviation was evaluated after 30-day use by ~~scores of~~

the following scoring system: Score 5: significantly alleviated, Score 4: obviously alleviated, Score 3: alleviated, Score 2: slightly alleviated, and Score 1: not alleviated. The result is shown in Table 2. ~~This reveals~~The result shows that the cosmetic that is the skin preparation for external use of the present invention has excellent whitening effect.

I	
Squalene	10 parts by weight
Sorbitan sesquistearate	2 parts by weight
Compound 1	0.05 part by weight
Butylparaben	0.1 part by weight
II	
1,3-buthanediol	5 parts by weight
Xanthan gum	0.1 part by weight
Acrylate alkyl-methacrylate alkyl (C10-30)	0.4 part by weight
Methylparaben	0.1 part by weight
Water	50 parts by weight
III	
Potassium hydroxide	0.2 part by weight
Water	32.05 parts by weight

Table 2

Sample	Score 5	Score 4	Score 3	Score 2	Score 1
Example 2		4	4	2	
Comparative Example 1				2	8

<Example 3>

A skin preparation for external use (cosmetic) was made in the same way as in Example 2 except that the amount of Compound 1 was changed, and similarly evaluated using 10 similar panelists. Similar effect was observed in this skin preparation for external use.

I	
Squalene	10 parts by weight
Sorbitan sesquistearate	2 parts by weight
Compound 1	0.1 part by weight
Butylparaben	0.1 part by weight
II	
1,3-buthanediol	5 parts by weight
Xanthan gum	0.1 part by weight
Arylate alkyl-methacrylate alkyl (C10-30)	0.4 part by weight
Methylparaben	0.1 part by weight
Water	50 parts by weight
III	
Potassium hydroxide	0.2 part by weight

Water	32.0 parts by weight

Table 3

Sample	Score 5	Score 4	Score 3	Score 2	Score 1
Example 3		5	4	1	

<Example 4>

According to a prescription shown below, a skin preparation for external use (cosmetic) was made in the same way as in Examples 2 and 3, and similarly evaluated using similar panelists. Comparative Example 2 in which Compound 1 was substituted by arbutin was made and similarly evaluated. The results are shown in Table 4. This ~~reveals~~ result shows that less whitening effect ~~of~~ due to the tyrosinase inhibitor was observed in the panelists and that the dendrite elongation inhibitor for melanocytes of the present invention was observed to effectively act even in such panelists.

I	
Squalene	10 parts by weight
Sorbitan sesquistearate	2 parts by weight
Compound 1	1 part by weight
Butylparaben	0.1 part by weight
II	
1,3-buthanediol	5 parts by weight
Xanthan gum	0.1 part by weight

Acrylate alkyl-methacrylate alkyl (C10-30) 0.4 part by Weight

Methylparaben 0.1 part by weight

Water 50 parts by weight

III

Potassium hydroxide 0.2 part by weight

Water 31.1 parts by weight

Table 4

Sample	Score 5	Score 4	Score 3	Score 2	Score 1
Example 3	1	6	3		
Comparative Example 2				3	7

Industrial Applicability

According to the present invention, a useful ingredient for inhibiting the elongation of melanocytic dendrites and alleviating, by this action, dyschromatosis ~~on which~~which is refractive to melanin production inhibitors utilizing ~~usual~~a tyrosinase inhibitory action ~~are not or less effective can be~~is provided.